Environmental Research and Distributed Energy Resources

New generation is needed in the short and long term to address growing shortfalls of electricity supplies. Distributed Energy Resources (DER) technologies offer short planning and construction timeframes and can be added in generation increments that meet local electricity demand growth. Additionally, DER can postpone transmission and distribution upgrades by being located at or near the load centers. These benefits can only be realized if DER technologies and its environmental performance are well defined and the technologies can be readily licensed for various California regulatory jurisdictions. The mission of the Public Interest Energy Research Environmental Area (PIEREA) is to develop cost effective approaches to evaluating and resolving environmental effects of energy production, delivery and use. In relation to distributed generation technologies, the role of PIEREA is to address environmental and regulatory issues through: 1) improving understanding and developing solutions to air quality, land-use, biological, and water-related impacts and 2) providing a scientific foundation for laws, policies and regulations affecting deployment of these technologies in California.

Partnerships for Developing Distributed Energy Systems

PIER Environmental Research is interested in pursuing and maintaining partnerships in distributed energy projects that encompass private industry, local, academic, state and federal interests. Currently, PEIREA is working with Southern California Gas, the Maxon corporation, EPRI, the COEN Corporation, the University of California, Irvine, the California Air Resources Board, and CAPCOA.

PIER Environmental Distributed Energy Projects

Reducing the Formation of NO_x in Gas Turbines

Low emissions technologies are driving the development of new generation stationary power sources. The next generation industrial burners and stationary gas turbines will be required to maintain extremely low levels of nitrogen oxides (NO_x) and carbon monoxide (CO) emissions, previously thought unattainable. Current state-of-the-art is to use back-end clean up of the exhaust stream with selective catalytic reduction (SCR) or a similar technique. This method, although effective, is costly and inelegant. Alternatively, burner and gas turbine manufacturers are striving to minimize the formation of pollutants at the source. Modern combustion systems will require active control to automatically achieve low emissions with simultaneous high efficiency and stability, regardless of changes in load, gas composition, or hardware deterioration.

A comprehensive *active control* strategy was successfully demonstrated for industrial gas burners and stationary gas turbines during this one-year program. The successes of this research are encouraging and timely due to the current state of the electric industry in California. Central station and small, distributed generators will compete in the deregulated electricity market, which could mean constant cycling of firing rate while still complying with some of the strictest air pollution regulations in the country.

Emissions Testing and Certification Guidelines for Distributed Energy Resources

The primary objective of this project is to establish an acceptable emission certification protocol for distributed generators— in particular, small combustion turbines, fuel cells, and internal combustion engines. Although these technologies offer potential benefits of shortened licensing times, and strategically located capacity additions in increments that match load growth, environmental performance uncertainties are limiting broader application by either distribution or generation companies. This project is in three phases. Phase 1 consists of a scoping study to establish test parameters, prepare a test plan, and coordinate with state an local air pollution control agencies. Phase 2 will consist of a trial test process, and Phase 3 will develop a program to test and certify manufacturer equipment. Under this project, statistical sampling techniques will be developed to allow “fleet” certification based upon random testing rather than every machine. A goal of this effort is to accelerate the deployment while ensuring consistency with emission limits applicable for these technologies.

Opportunities for PIER Environmental Funding

There are no planned solicitations.